AMSU Forward Model and Obs.-Calc. T_B

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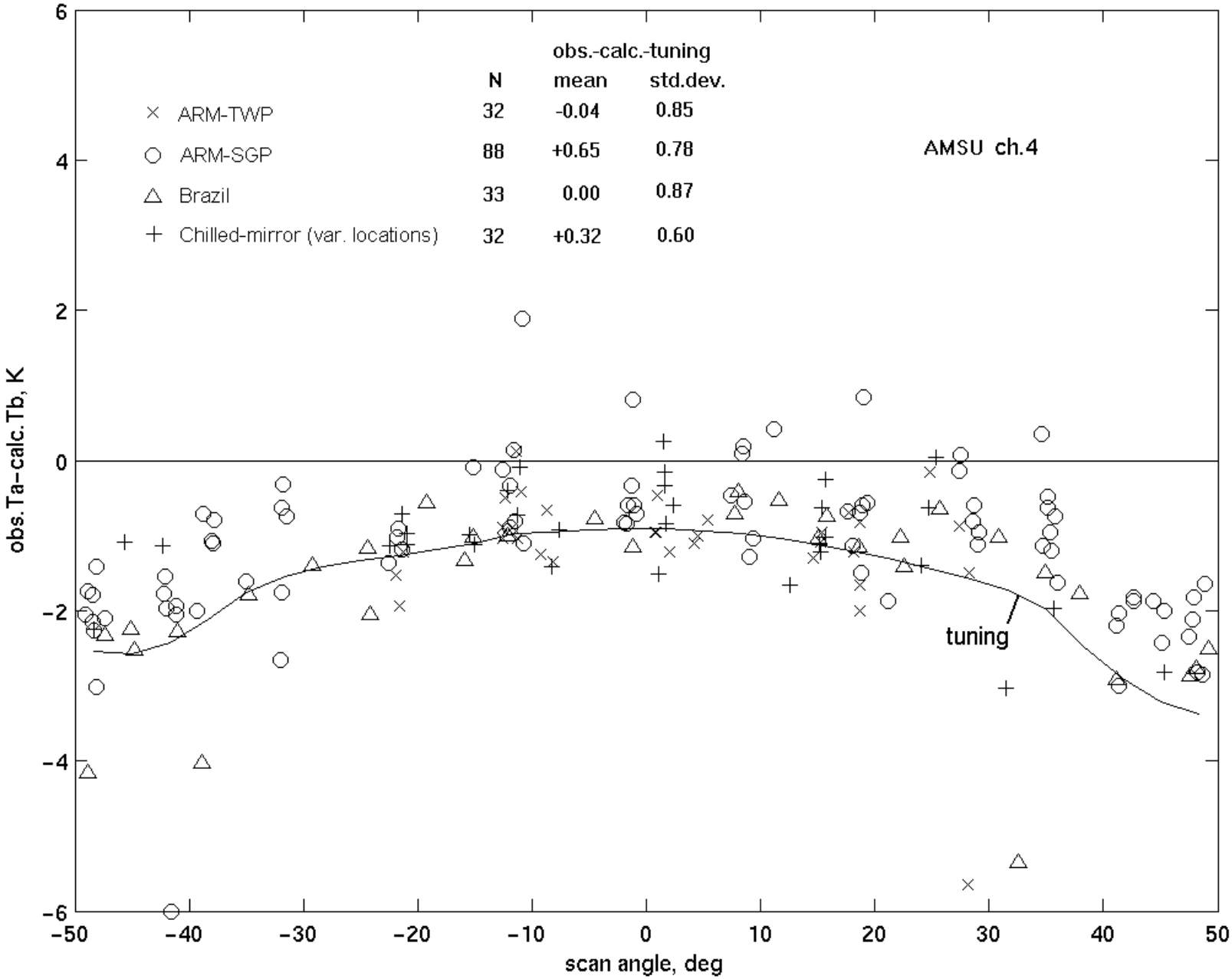
AIRS Team Meeting

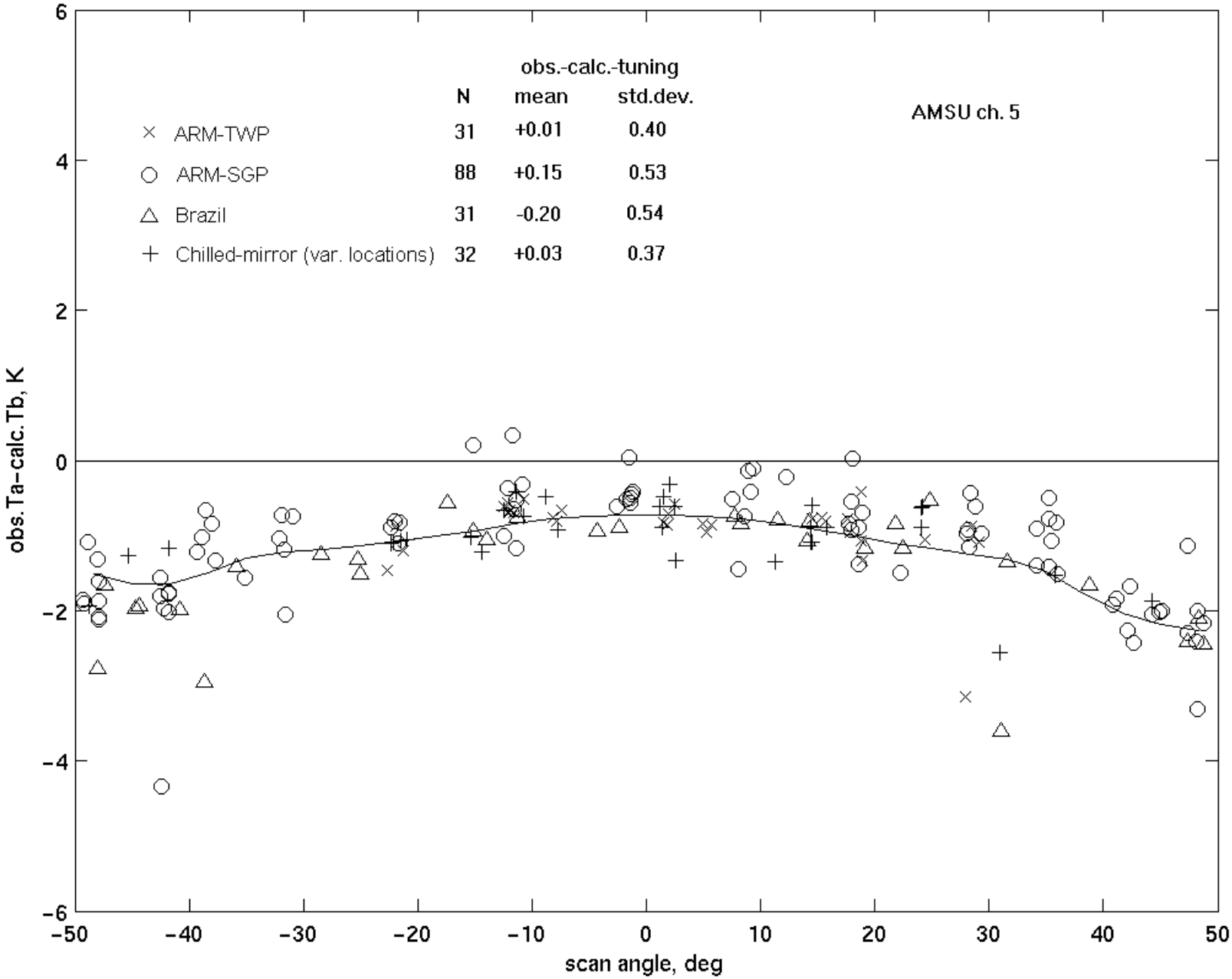
May 3-6, 2005

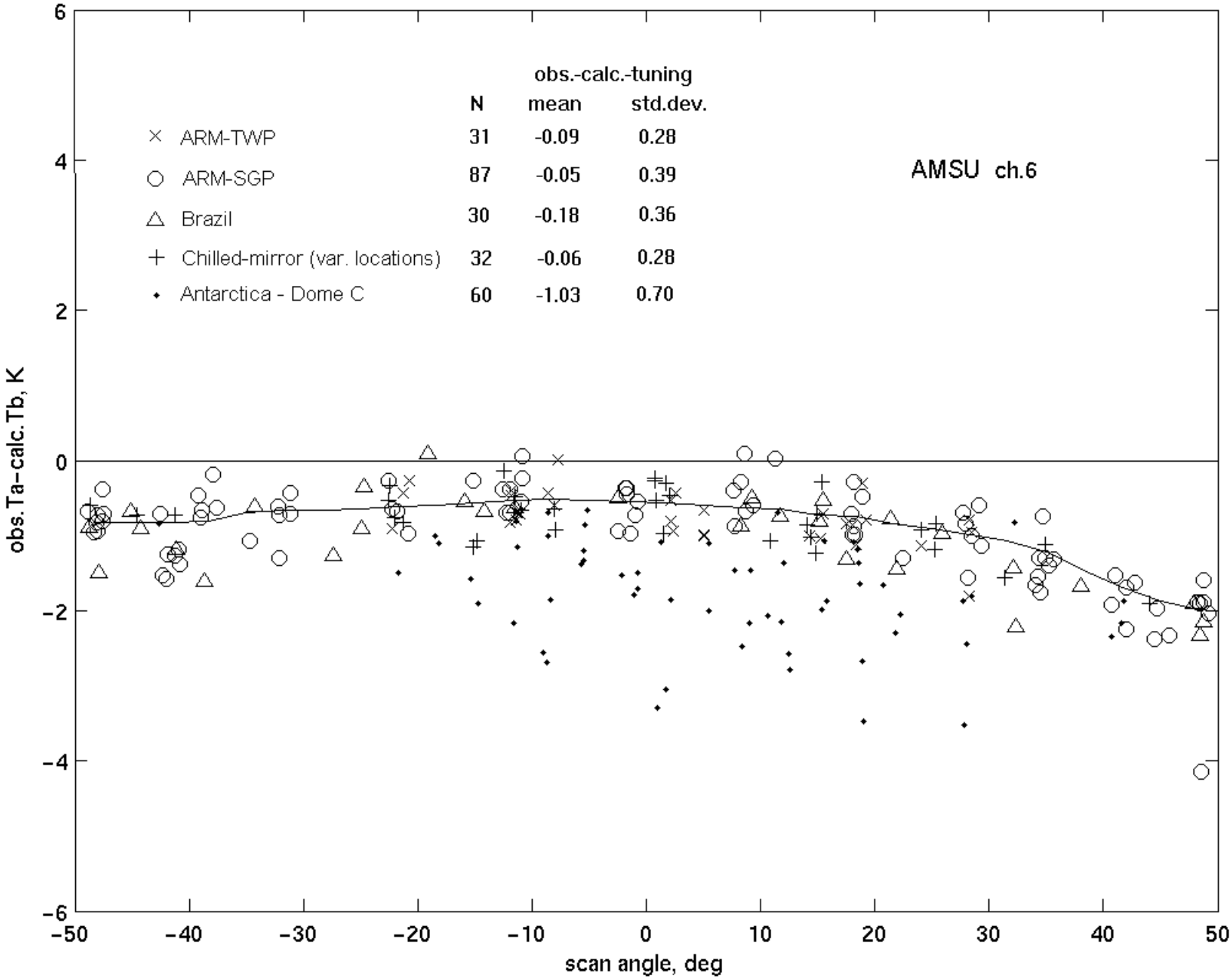
AMSU Temperature Channels 4 to 9

- Brightness temperatures were calculated from 5 dedicated raob sets, using retrieved surface brightness.

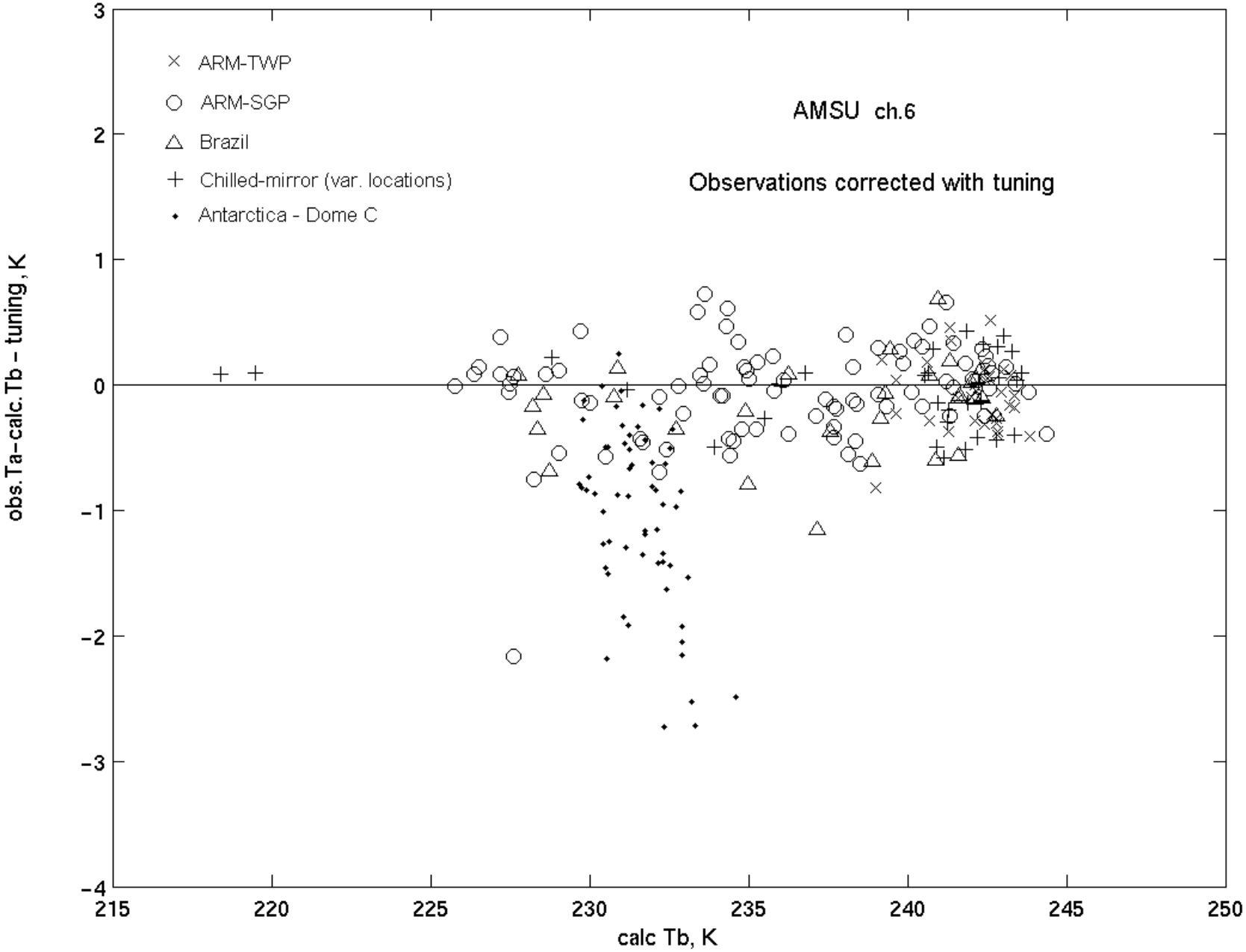
- (Observed Ta - calculated Tb) is compared with bias tuning from GSFC.


obs.-calc.-tuning
N mean std.dev.
× ARM-TWP 32 -0.04 0.85
○ ARM-SGP 88 +0.65 0.78
△ Brazil 33 0.00 0.87
+ Chilled-mirror (var. locations) 32 +0.32 0.60
AMSU ch.4
tuning
obs.Ta−calc.Tb, K
scan angle, deg
6
4
2
0
−2
−4
−6
−50
−40
−30
−20
−10
0
10
20
30
40
50

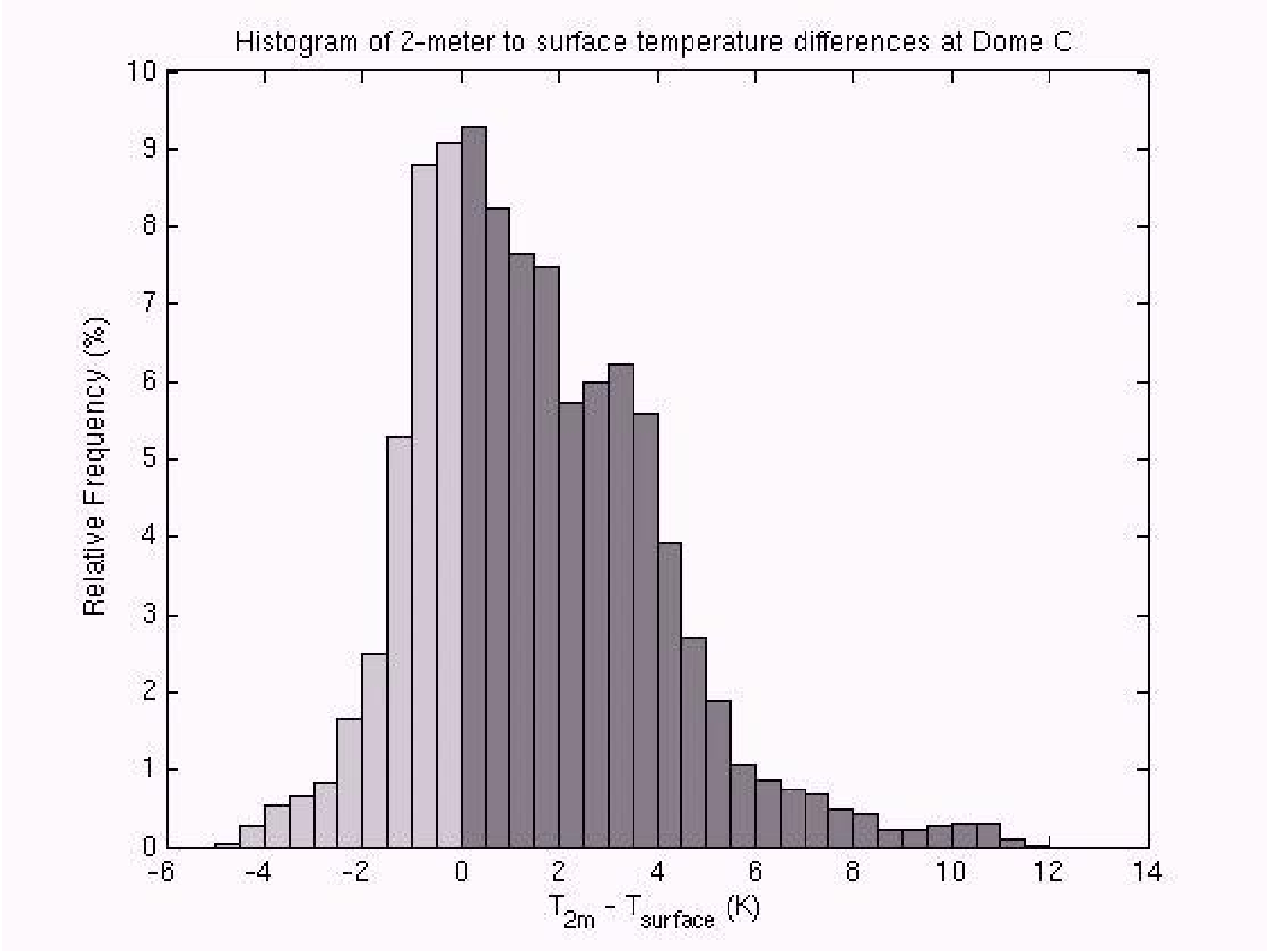

obs.-calc.-tuning
N mean std.dev.
AMSU ch. 5
ARM-TWP 31 +0.01 0.40
ARM-SGP 88 +0.15 0.53
Brazil 31 -0.20 0.54
Chilled-mirror (var. locations) 32 +0.03 0.37
obs.Ta−calc.Tb, K
scan angle, deg
6
4
2
0
−2
−4
−6
−50
−40
−30
−20
−10
0
10
20
30
40
50

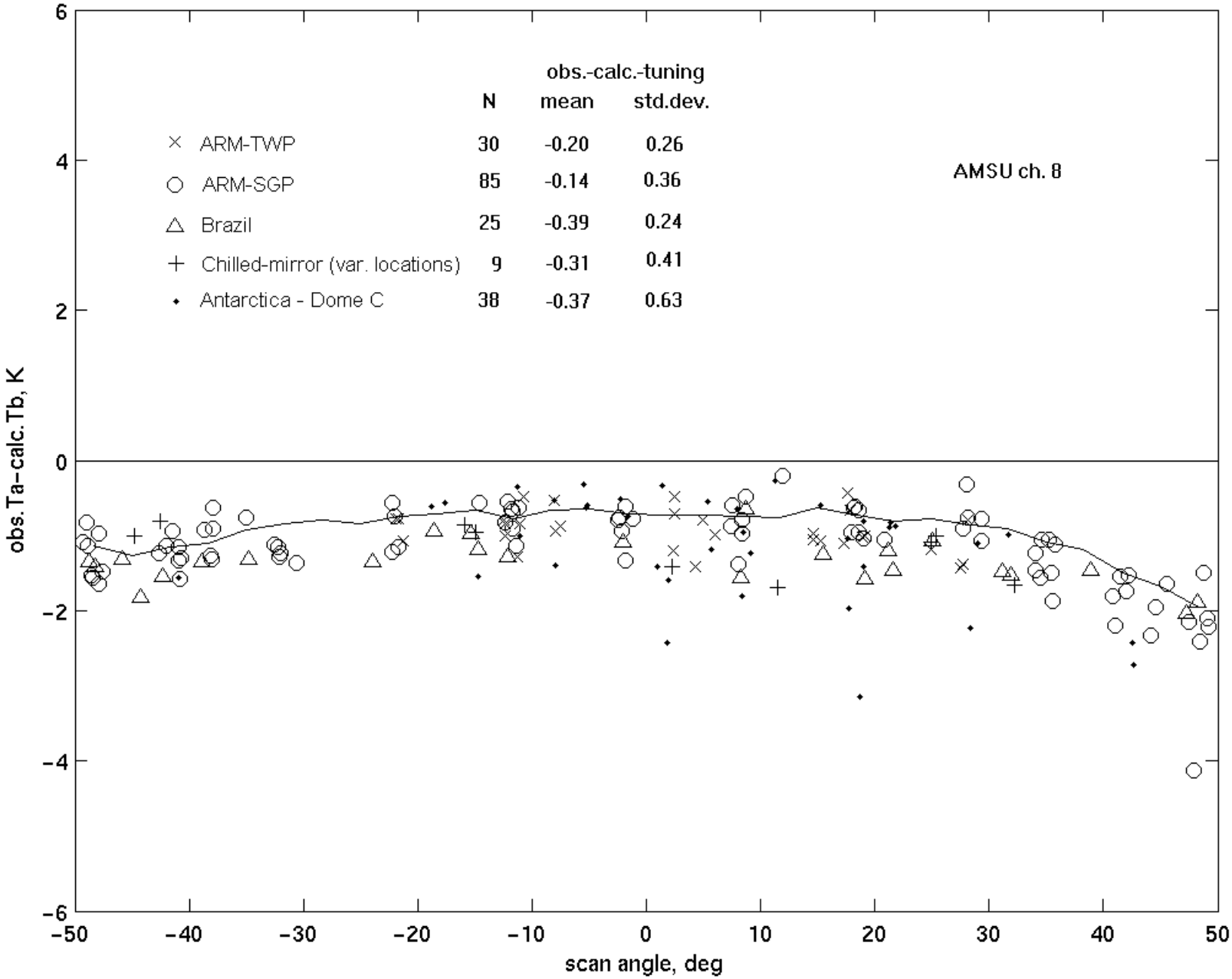

obs.-calc.-tuning
N mean std.dev.
ARM-TWP 31 -0.09 0.28
ARM-SGP 87 -0.05 0.39
Brazil 30 -0.18 0.36
Chilled-mirror (var. locations) 32 -0.06 0.28
Antarctica - Dome C 60 -1.03 0.70
AMSU ch.6
obs.Ta−calc.Tb, K
scan angle, deg
6
4
2
0
−2
−4
−6
−50
−40
−30
−20
−10
0
10
20
30
40
50

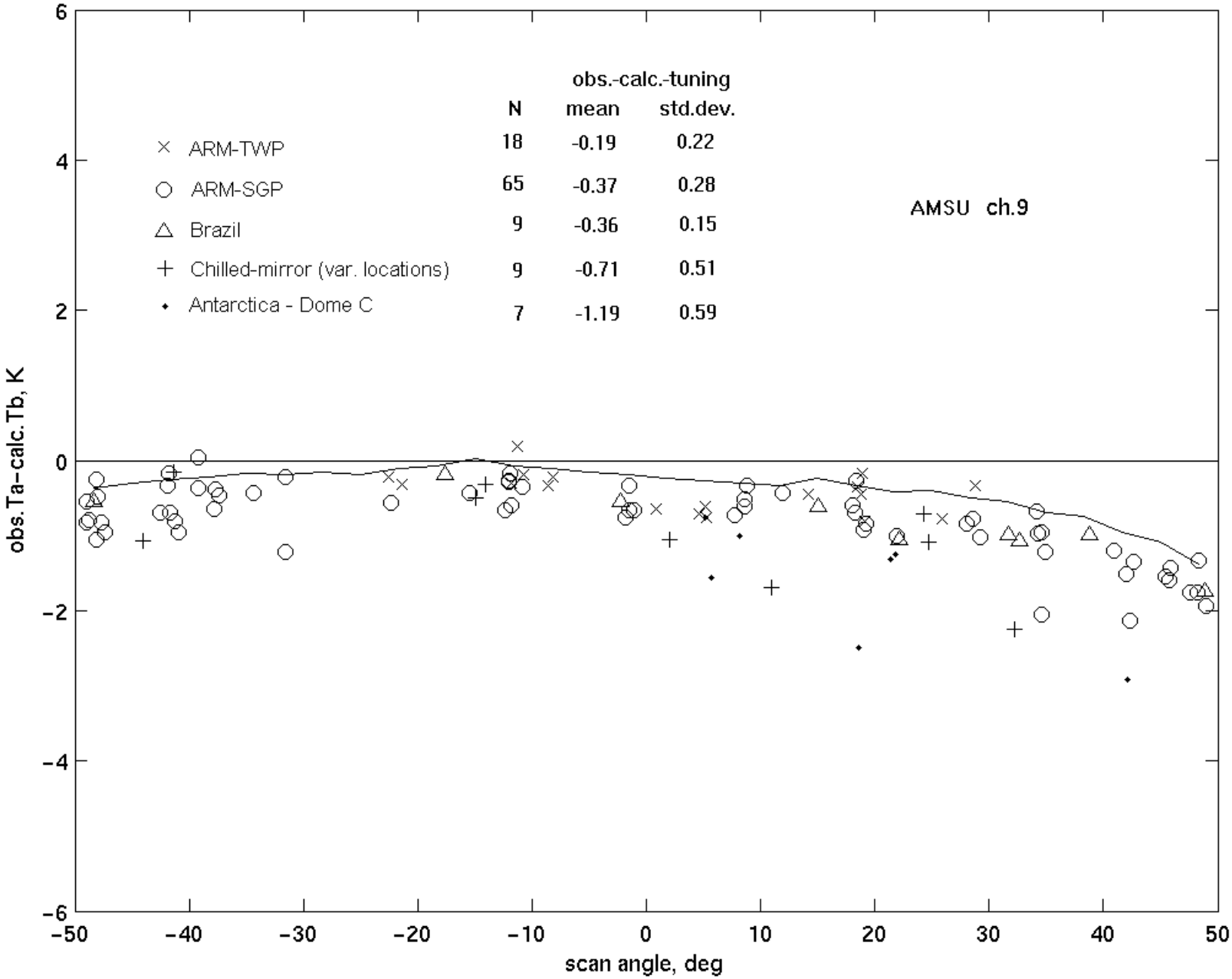
Dome-C soundings may have a warm bias…



... but some of the discrepancies may be contributed by a surface colder than the air (~< 0.4 K) and scattering more specular than Lambertian (< 0.4 K).




obs.-calc.-tuning
N mean std.dev.
ARM-TWP 30 -0.20 0.26
ARM-SGP 85 -0.14 0.36
Brazil 25 -0.39 0.24
Chilled-mirror (var. locations) 9 -0.31 0.41
Antarctica - Dome C 38 -0.37 0.63
AMSU ch. 8
obs.Ta−calc.Tb, K
scan angle, deg
6
4
2
0
−2
−4
−6
−50
−40
−30
−20
−10
0
10
20
30
40
50

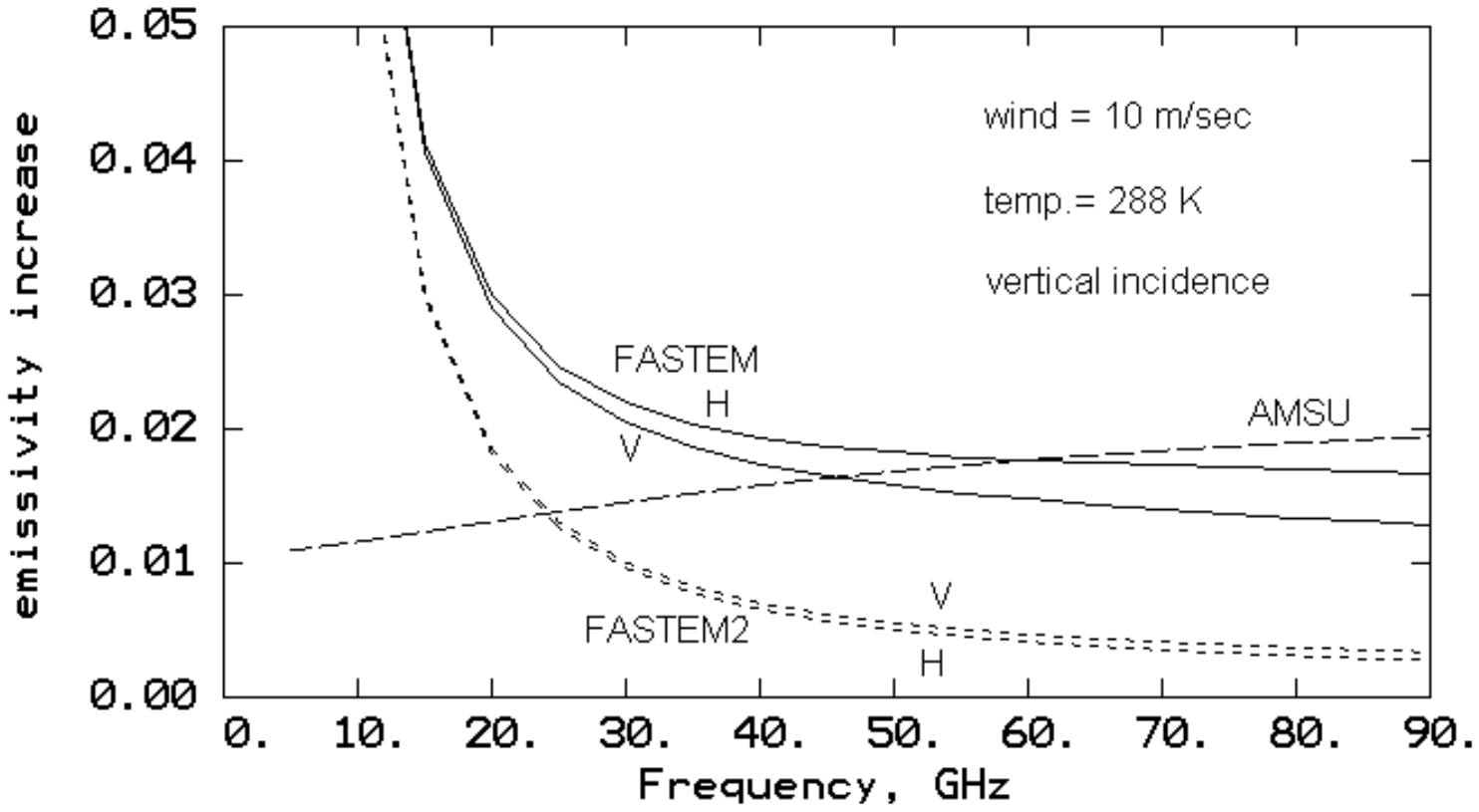

obs.-calc.-tuning
N mean std.dev.
ARM-TWP 18 -0.19 0.22
ARM-SGP 65 -0.37 0.28
Brazil 9 -0.36 0.15
Chilled-mirror (var. locations) 9 -0.71 0.51
Antarctica - Dome C 7 -1.19 0.59
AMSU ch.9
obs.Ta−calc.Tb, K
scan angle, deg
6
4
2
0
−2
−4
−6
−50
−40
−30
−20
−10
0
10
20
30
40
50

AMSU Surface/H_2O Channels 1, 2, 3, 15

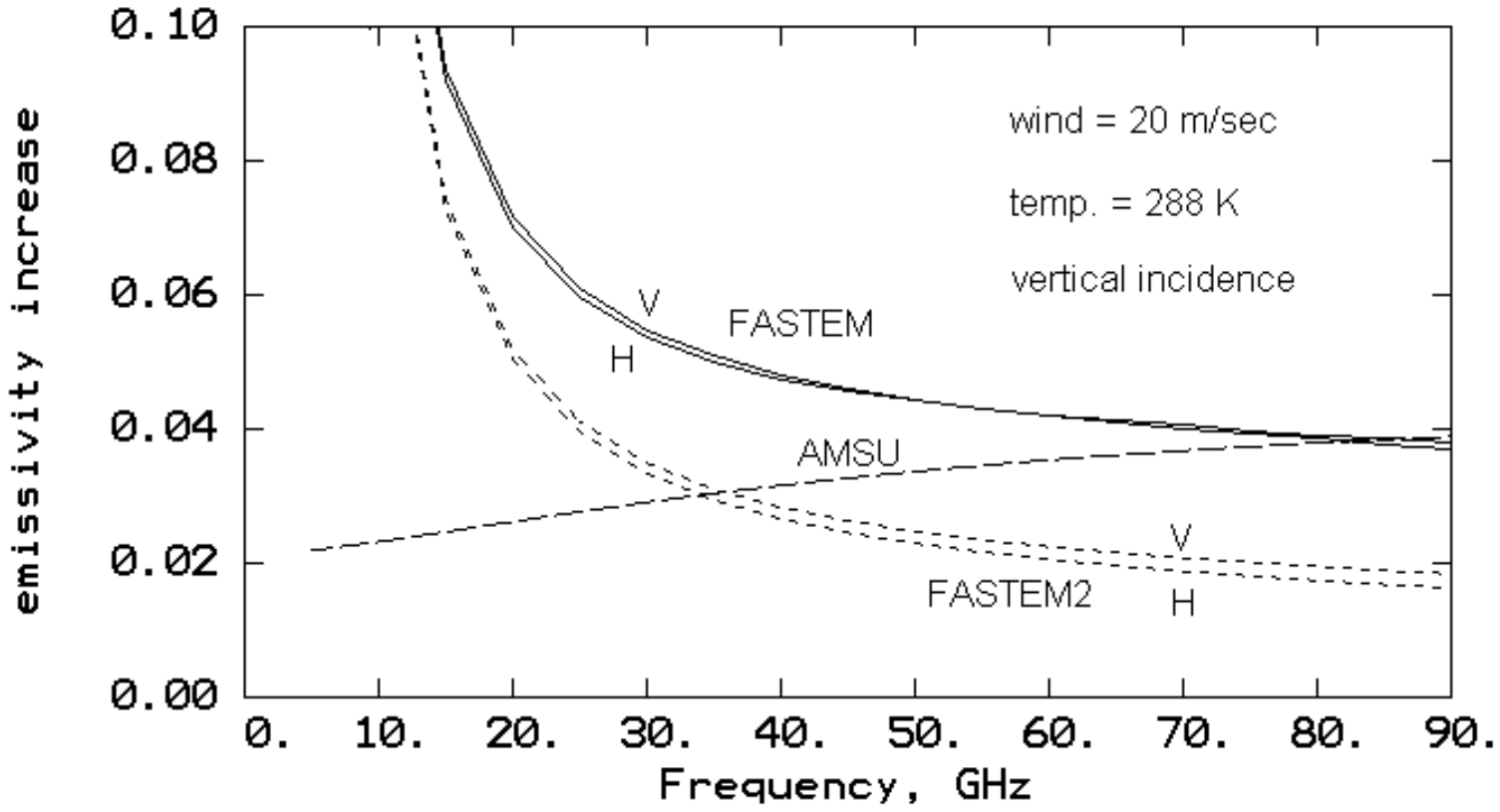
- Brightness temperatures were calculated for ARM-TWP using in-situ wind speed with the new stand-alone counterpart of the L2 forward model.

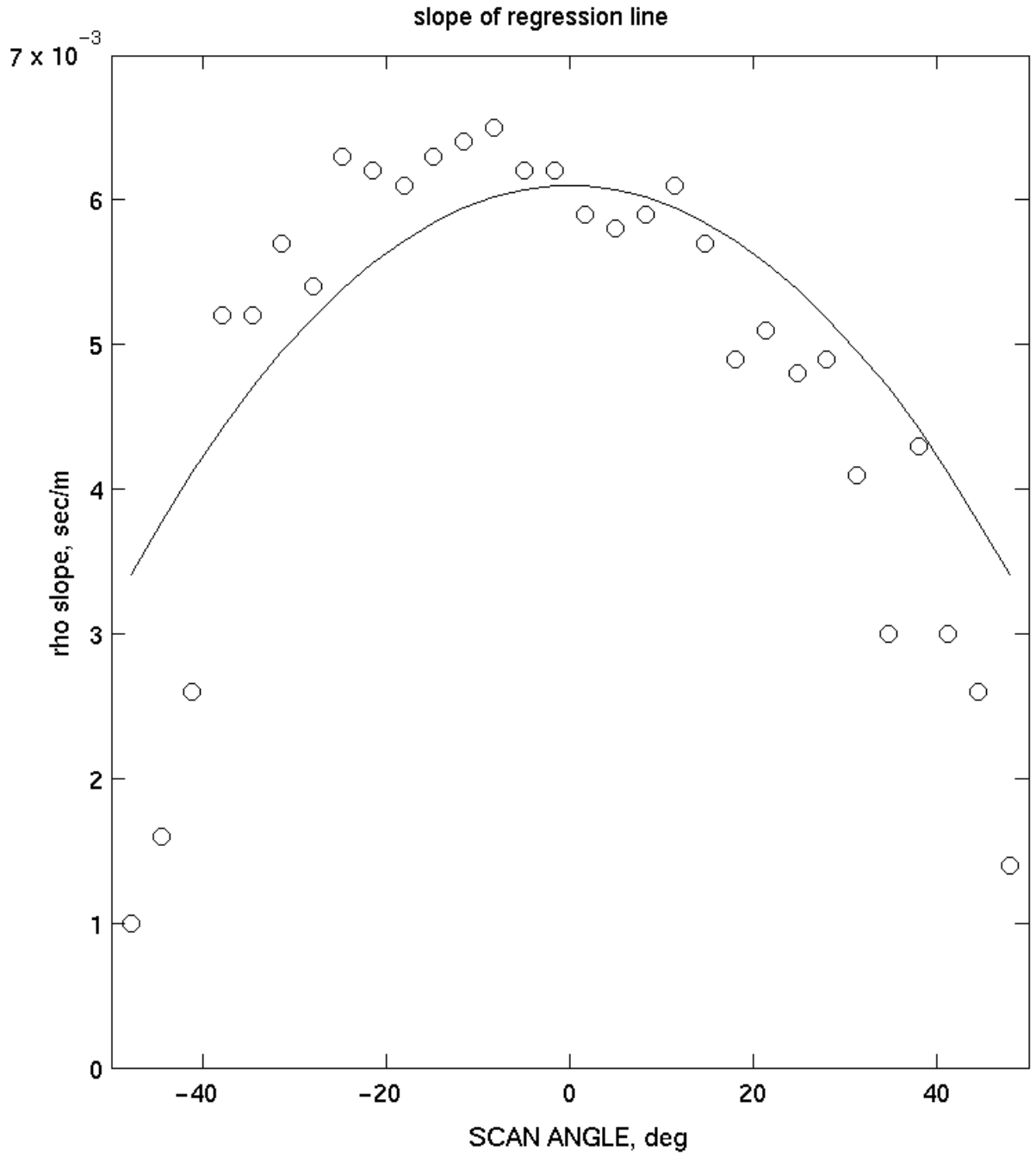
- The stand-alone surface model is based on regression of retrieved surface parameters against AVN wind speed (see JGR manuscript by Rosenkranz & Barnet). It replaced the Fastem model used previously.

The AMSU-derived model shows sensitivity to wind increasing with frequency, while Fastem sensitivity decreases with frequency due to its small-scale component.



The AMSU model results from a linear regression, while Fastem is nonlinear with wind speed.

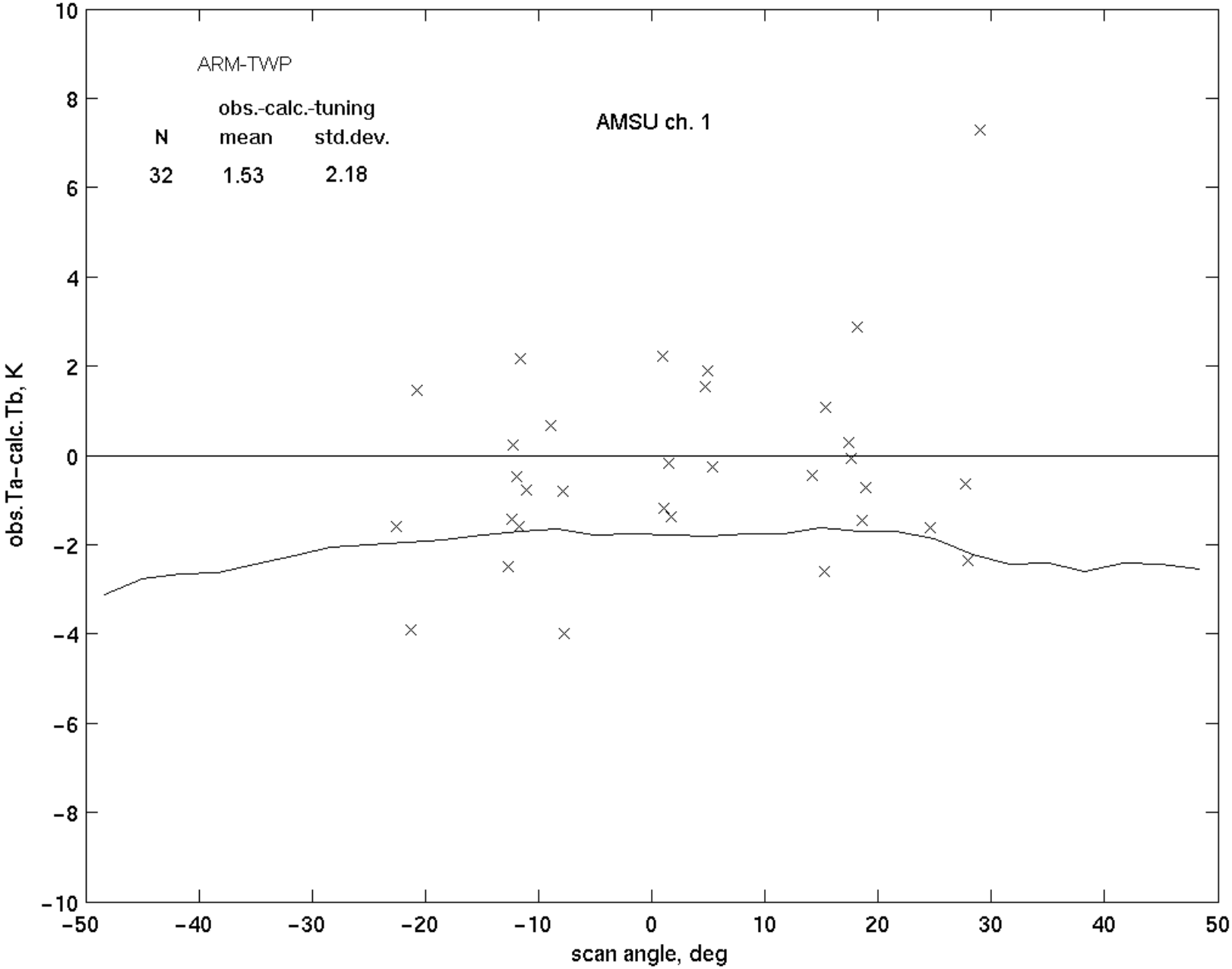


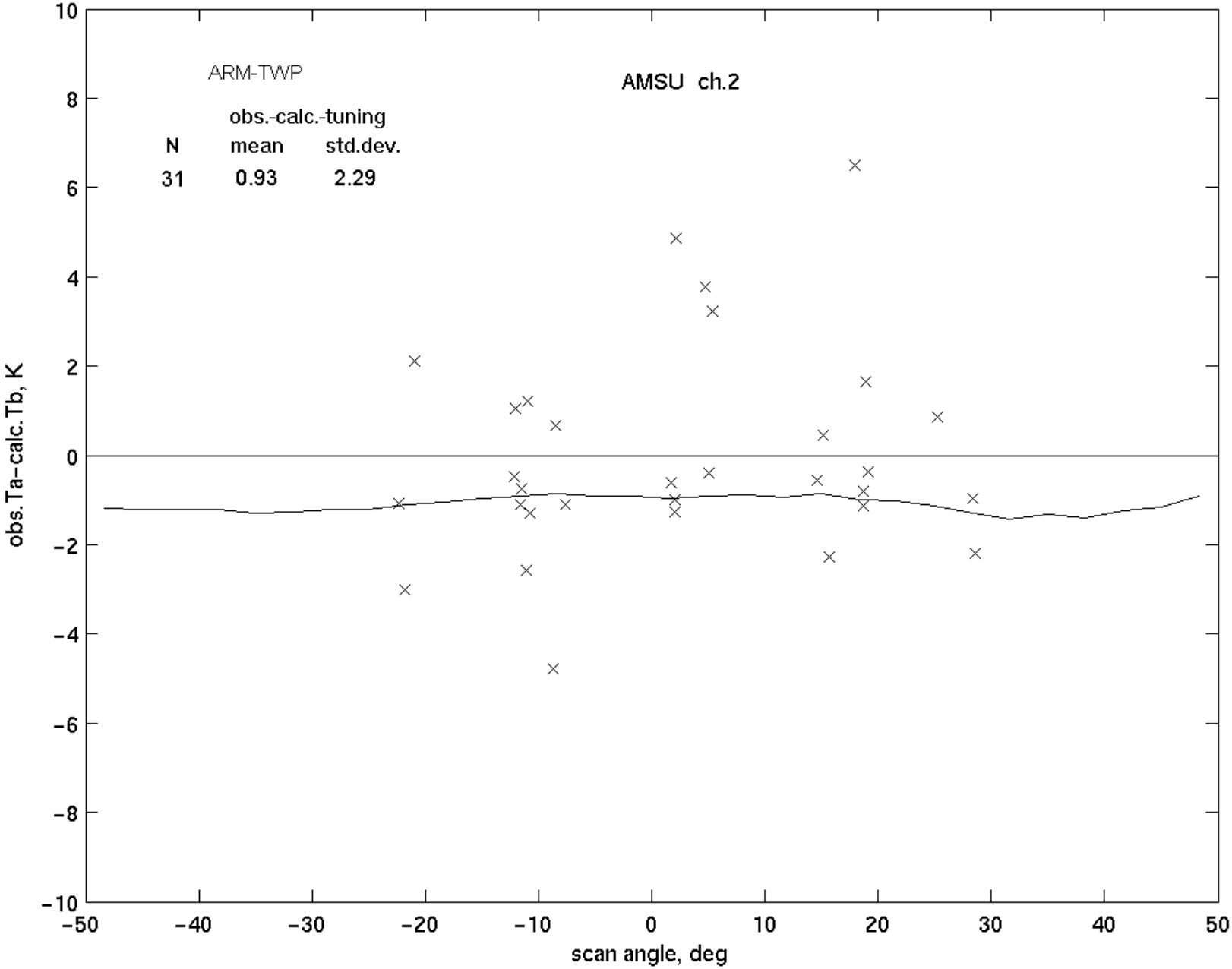


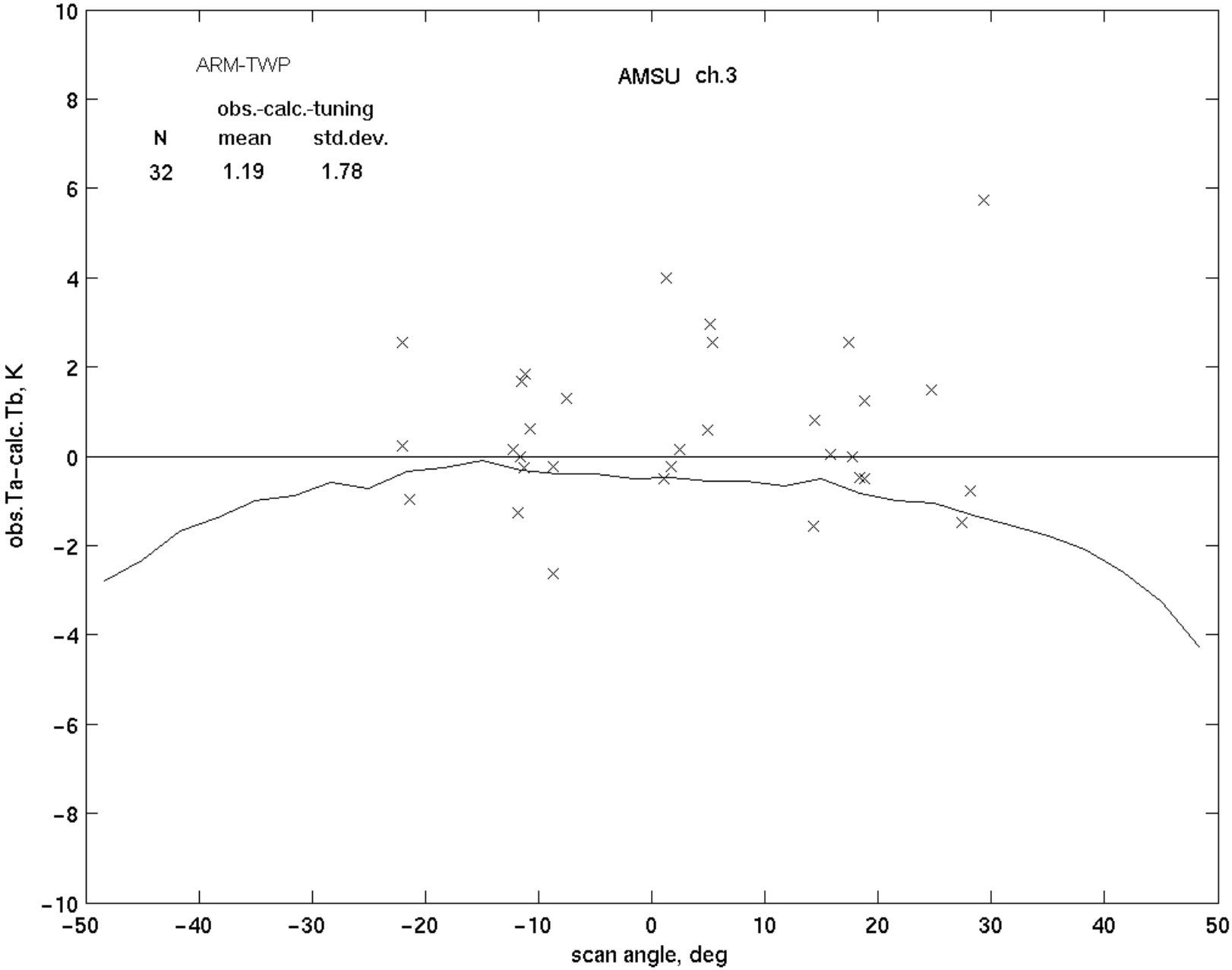
Ratio of reflected to direct path length also increases with wind speed.

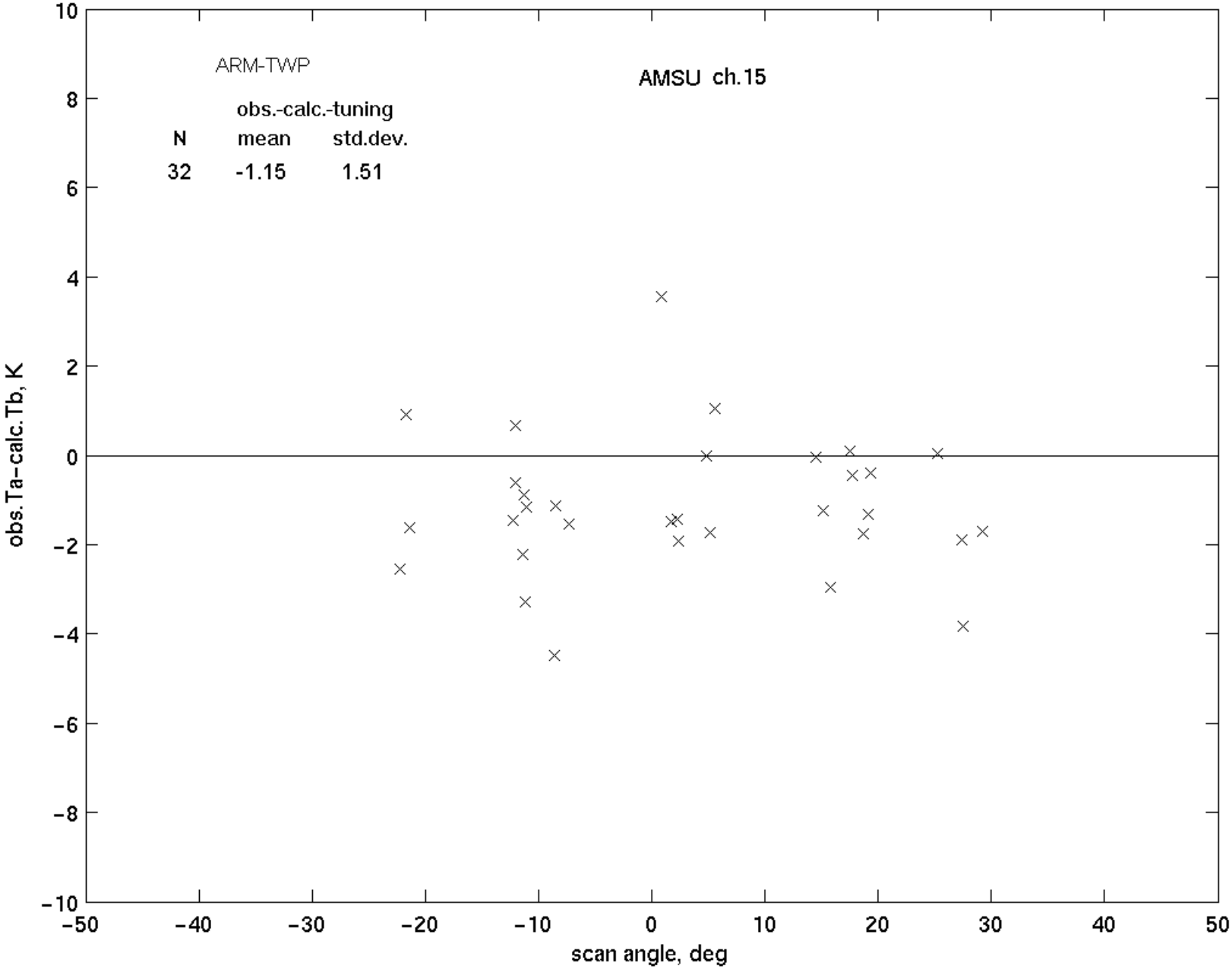
$\rho \sim$ windspeed

(obtained through regression)


ARM-TWP
obs.-calc.-tuning
N mean std.dev.
32 1.53 2.18
AMSU ch. 1
obs.Ta−calc.Tb, K
scan angle, deg
10
8
6
4
2
0
−2
−4
−6
−8
−10
−50
−40
−30
−20
−10
0
10
20
30
40
50


ARM-TWP
AMSU ch.2
obs.-calc.-tuning
N mean std.dev.
31 0.93 2.29
obs.Ta-calc.Tb, K
scan angle, deg
10
8
6
4
2
0
-2
-4
-6
-8
-10
-50
-40
-30
-20
-10
0
10
20
30
40
50


ARM-TWP
AMSU ch.3
obs.-calc.-tuning
N mean std.dev.
32 1.19 1.78
obs.Ta-calc.Tb, K
scan angle, deg
10
8
6
4
2
0
-2
-4
-6
-8
-10
-50
-40
-30
-20
-10
0
10
20
30
40
50


ARM-TWP
AMSU ch.15
obs.-calc.-tuning
N mean std.dev.
32 -1.15 1.51
obs.Ta-calc.Tb, K
scan angle, deg
10
8
6
4
2
0
-2
-4
-6
-8
-10
-50
-40
-30
-20
-10
0
10
20
30
40
50

Conclusions

- The present bias tuning fits AMSU channels 4 - 9 fairly well, but further examination of temperature extremes is advisable.

- AMSU window channel tuning may need some adjustments, which should be done using m_rta revision of 2/2/05 or later. However, the same bias tuning may not be optimum for both land and water surfaces.